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ABSTRACT TITLE: Measurement and Estimation of the Power Density of Ionomeric Polymer-Metal Composites (IPMC)

AUTHOR LISTING: Xiaoqi Bao, Yoseph Bar-Cohen and Shyh-Shiuh Lih

JPL/Caltech, (MS 67-119), 4800 Oak Grove Drive, Pasadena, CA 91109-8099, Phone 818-354-0298, Fax 818-393-4057, **xbao@jpl.nasa.gov** web: **http://ndea.jpl.nasa.gov**

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ABSTRACT TEXT

The Ionomeric Polymer-Metal Composites (IPMC) electroactive polymers are attractive actuation materials because of their features of large electrically induced bending, mechanical flexibility, low excitation voltage, low density, and ease of fabrication. The material bending results form ion movement from one electrode to another. Generally, the power density is one of the important properties that are being sought for an electrically active material. The unique features of the IPMC materials and the special operating environments require new approaches to measuring the power character. This paper addresses the methods of measuring and estimating the power characteristics of the IPMCs. A measurement system with relatively high-resolution/high-speed camera is set to record 2-D images of the deformed IMPC strips in liquids under different electric excitations and mechanical loadings. Image processing software is developed to extract electroactive parameters and estimating the power capacity. Results of several types of IPMCs are presented and compared with other actuation materials.

KEYWORDS: Electroactive Polymers (EAP), Ionomeric Polymer-Metal Composites (IPMC), Material Characterization, Image Processing, Actuators, Active Materials.

BRIEF BIOGRAPHY: Dr. Xiaoqi Bao is a Member of the Engineering Staff at the NDE and Advanced Actuators (NDEAA) team of the Jet Propulsion Laboratory. He joined JPL in May 1997 after serving for about ten years as a Research Associate at Pennsylvania State University. He received his Ph. D., Physics, in 1985 and M. Sc., Physics, in 1982 from the Chinese Academy of Sciences, Beijing, China. In 1986, Dr. Bao was a Visiting Scientist at the Dept. of Electrical Engineering of Toyama University, Japan. He has research experience in actuators, composite materials, piezoelectric motors, SAW sensors, active vibration and sound control, and intelligent materials/structures. He has published more than 30 papers in related research areas.